

Turbo 2 ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching and conduction losses
- Low thermal resistance

Description

The STTH15L06, which is using ST Turbo 2 600 V technology, is specially suited for use in switching power supplies, and industrial applications, as rectification and discontinuous mode PFC boost diode.

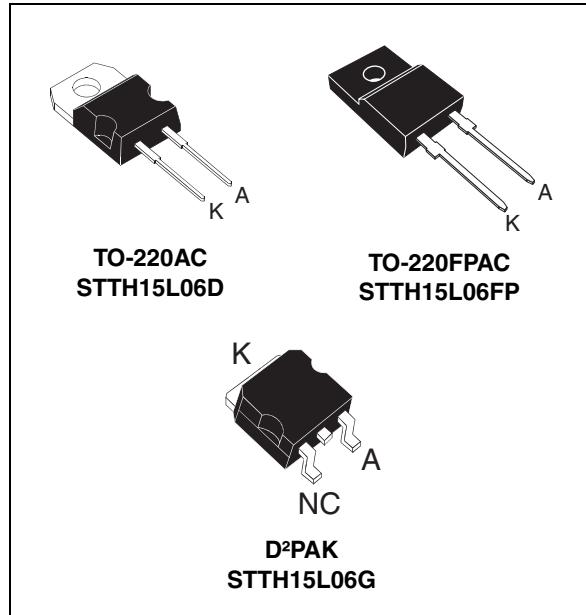


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	Up to 20 A
V_{RRM}	600 V
T_j	175 °C
V_F (typ)	0.95 V
t_{rr} (max)	55 ns

1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			600	V
$I_{F(RMS)}$	Forward rms current			30	A
$I_{F(AV)}$	Average forward current $\delta = 0.5$	TO-220AC / D ² PAK	$T_c = 140 \text{ }^\circ\text{C}$	15	A
			$T_c = 120 \text{ }^\circ\text{C}$	20	
		TO-220FPAC	$T_c = 90 \text{ }^\circ\text{C}$	15	
I_{FSM}	Surge non repetitive forward current	$t_p = 10 \text{ ms sinusoidal}$		150	A
T_{stg}	Storage temperature range			-65 to + 175	$^\circ\text{C}$
T_j	Maximum operating junction temperature			175	$^\circ\text{C}$

Table 3. Thermal parameter

Symbol	Parameter		Maximum	Unit
$R_{th(j-c)}$	Junction to case		TO-220AC / D ² PAK	1.7
	TO-220FPAC		4.0	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25 \text{ }^\circ\text{C}$	$V_R = V_{RRM}$			15	μA
		$T_j = 150 \text{ }^\circ\text{C}$			40	400	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25 \text{ }^\circ\text{C}$	$I_F = 15 \text{ A}$			1.55	V
		$T_j = 150 \text{ }^\circ\text{C}$			0.95	1.2	

1. Pulse test: $t_p = 5 \text{ ms}$, $\delta < 2 \%$
2. Pulse test: $t_p = 380 \text{ } \mu\text{s}$, $\delta < 2 \%$

To evaluate the maximum conduction losses use the following equation:

$$P = 0.94 \times I_{F(AV)} + 0.017 I_F^2 (RMS)$$

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$T_j = 25^\circ\text{C}$	$I_F = 0.5 \text{ A}, I_{rr} = 0.25 \text{ A}, I_R = 1 \text{ A}$			55	ns
			$I_F = 1 \text{ A}, \frac{dI_F}{dt} = 50 \text{ A}/\mu\text{s}, V_R = 30 \text{ V}$		60	85	
I_{RM}	Reverse recovery current	$T_j = 125^\circ\text{C}$	$I_F = 15 \text{ A}, \frac{dI_F}{dt} = 100 \text{ A}/\mu\text{s}, V_R = 400 \text{ V}$		8.5	12	A
t_{fr}	Forward recovery time	$T_j = 25^\circ\text{C}$	$I_F = 15 \text{ A}, \frac{dI_F}{dt} = 100 \text{ A}/\mu\text{s}$			300	ns
V_{FP}	Forward recovery voltage		$V_{FR} = 1.1 \times V_{F\max}$		3		V

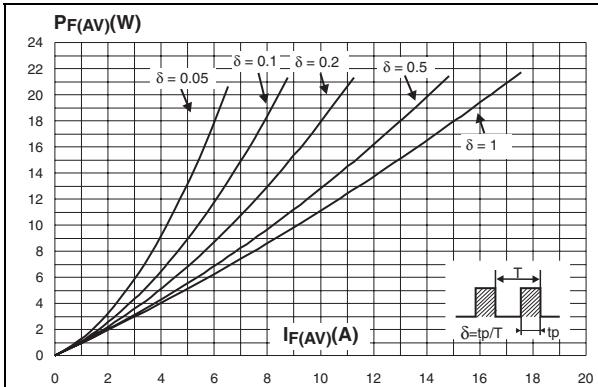
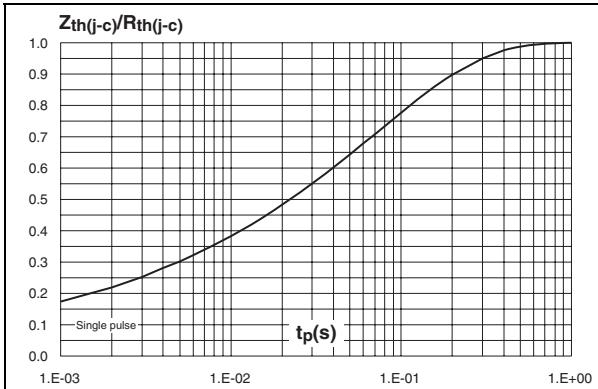
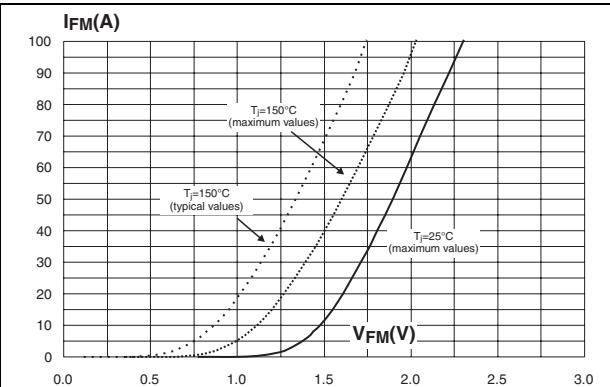
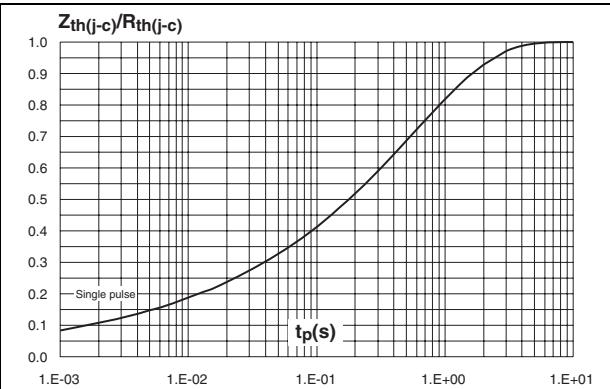
Figure 1. Conduction losses versus average current**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, D²PAK)****Figure 2. Forward voltage drop versus forward current****Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)**

Figure 5. Peak reverse recovery current versus di_F/dt (90 % confidence)

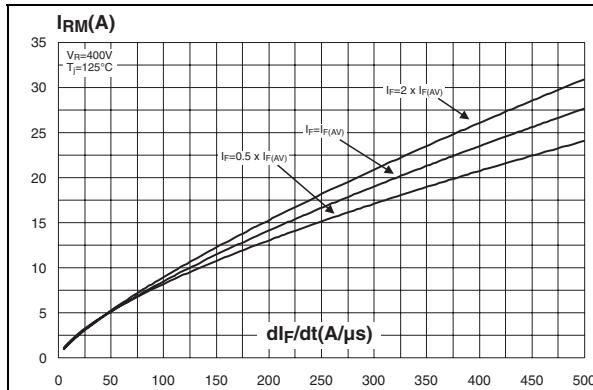


Figure 6. Reverse recovery time versus di_F/dt (90 % confidence)

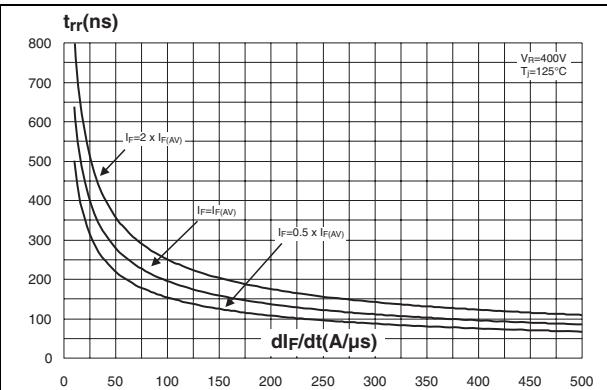


Figure 7. Reverse recovery charges versus di_F/dt (90 % confidence)

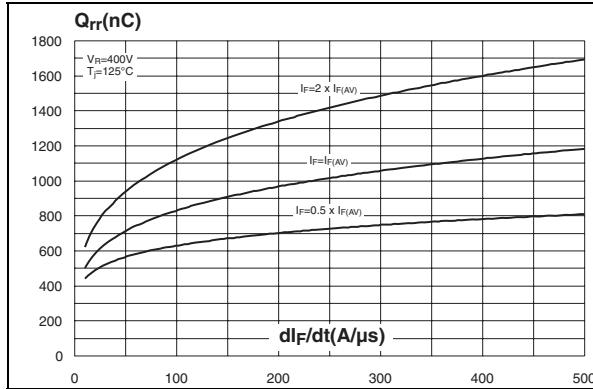


Figure 8. Softness factor versus di_F/dt (typical values)

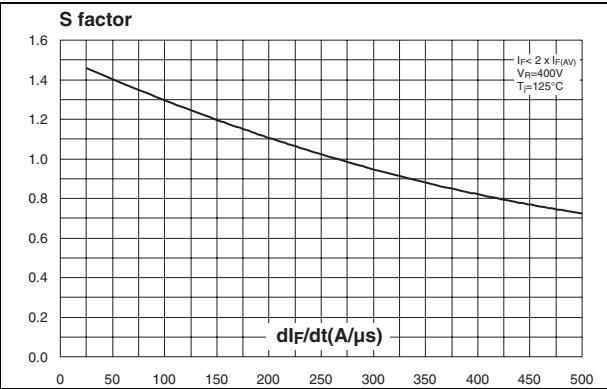


Figure 9. Relative variations of dynamic parameters versus junction temperature

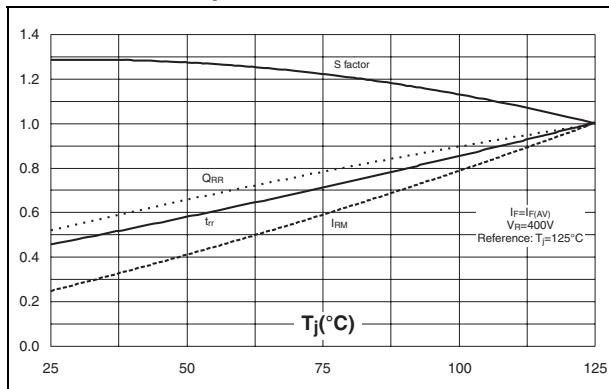


Figure 10. Transient peak forward voltage versus di_F/dt (90 % confidence)

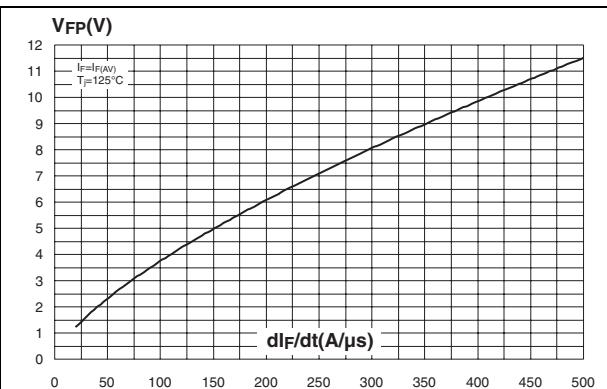


Figure 11. Forward recovery time versus di_F/dt (90 % confidence)

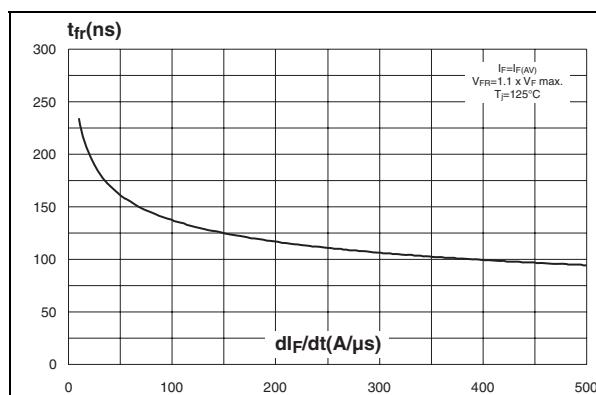


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

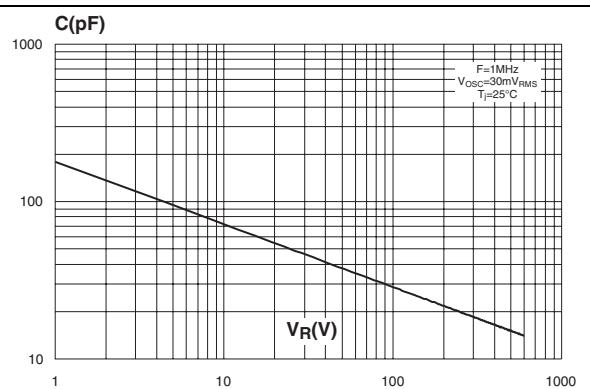
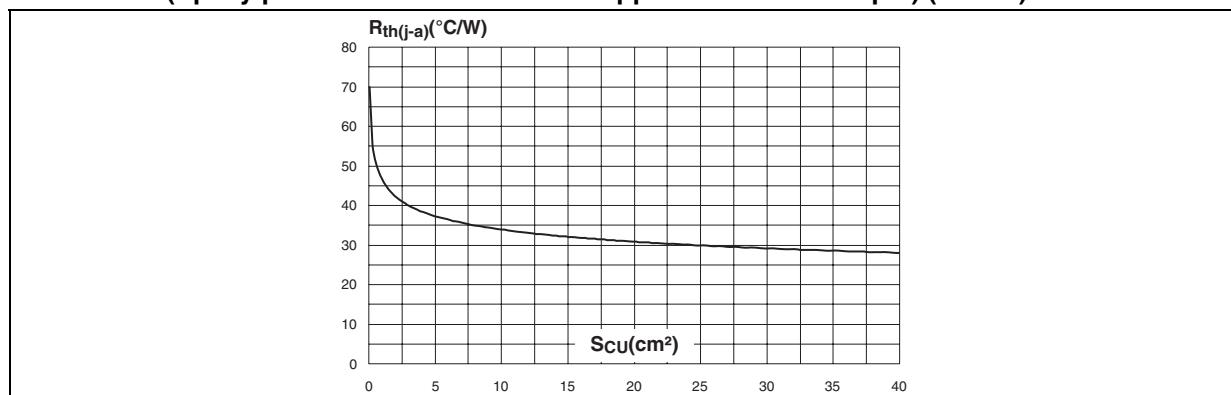


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4 copper thickness = 35 μ m) (D²PAK)



2 Package information

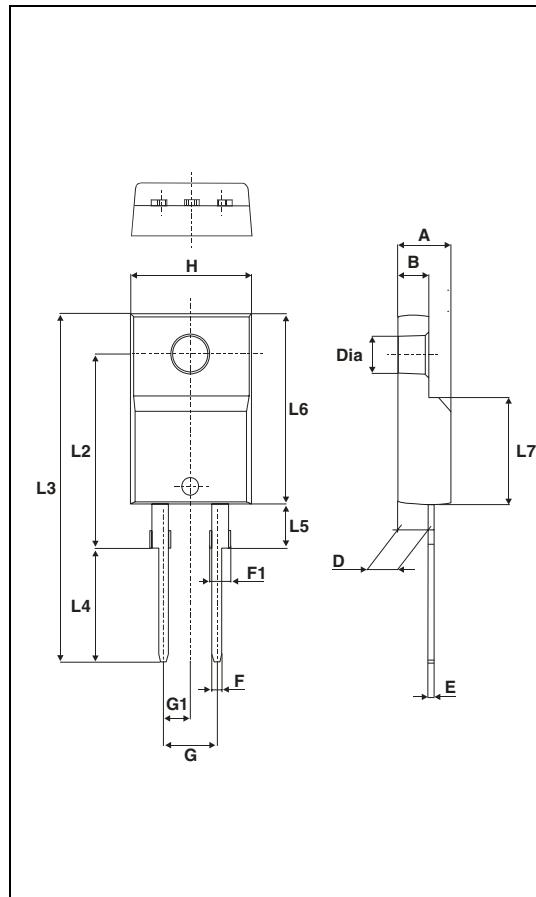
- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com.
ECOPACK® is an ST trademark.

Table 6. TO-220AC dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Dia. I	3.75	3.85	0.147	0.151

Table 7. TO-220FPAC dimensions

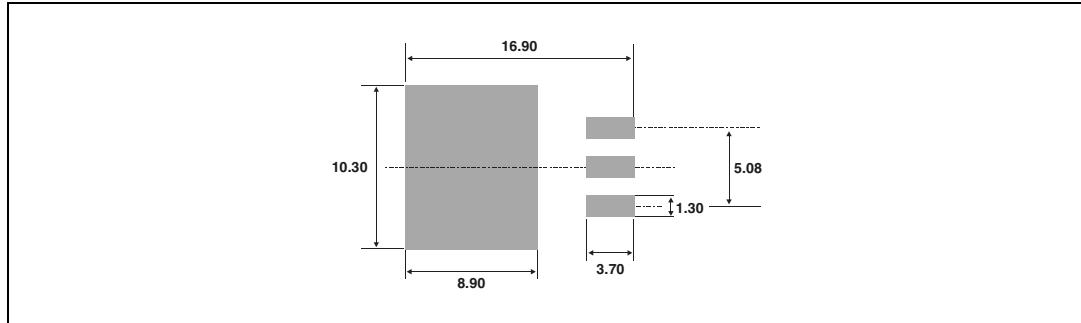


Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

Table 8. D²PAK dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 14. Footprint (dimensions in mm)



3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH15L06D	STTH15L06D	TO-220AC	1.90 g	50	Tube
STTH15L06G	STTH15L06G	D ² PAK	1.48 g	50	Tube
STTH15L06G-TR	STTH15L06G	D ² PAK	1.48 g	1000	Tape and reel
STTH15L06FP	STTH15L06FP	TO-220FPAC	1.70 g	50	Tube

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
07-Sep-2004	1	First issue
15-Jul-2011	2	Updated I _{FSM} from 130 A to 150 A.

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